



- ART. VI. (1.) *Second Report of the Commissioners for the Exhibition of 1851, to the Right Hon. Spencer Horatio Walpole, &c. &c., one of her Majesty's Principal Secretaries of State.*
- (2.) *Industrial Instruction on the Continent: being the Introductory Lecture of the Session 1852-53, at the Government School of Mines.* By LYON PLAYFAIR, C.B., F.R.S.
- (3.) *Exhibition of the Works of Industry of all Nations, 1851. Reports of the Juries on the Subjects in the Thirty Classes into which the Exhibition was divided.*
- (4.) *Report on Foreign Schools of Design.* By MR. DYCE.
- (5.) *Hints on an Improved and Self-Paying System of National Education.* By the Reverend RICHARD DAWES, A.M., Dean of Hereford.
- (6.) *Estimates, &c., Civil Services for the year ending 31st March, 1853. Education, Science, and Art.*

AT the opening of the new Parliament on November 11th, 1852, a pressing necessity is enforced upon the Legislature, in her Majesty's speech, in the following words:—‘*The advancement of the fine arts and of practical science will be readily recognised by you as worthy of the attention of a great and enlightened nation. I have directed that a comprehensive scheme shall be laid before you, having in view the promotion of these objects, towards which I invite your aid and co-operation.*’ This indicates a movement new to this country, and claims our closest attention. The word SCIENCE appears for the first time in our history in a speech from the throne.

There exists a law of human progress, although that law is beyond the reach of human intellect. There are several distinguishing differences between the conditions of the ancient monarchies, the old republics, and those of the present age; yet dare we hope that the law of mutability is suspended in their favour? We think not. It would, however, appear that to man is entrusted a certain amount of independent power, by cultivating which he may advance himself with more celerity, or, to a higher point, and maintain his position for a longer period—by neglecting which he accelerates his fall, or precipitates himself to a yet lower point of degradation.

But it would also appear, that there is naturally a disposition in man to yield to the seductions of luxurious idleness—that a constant effort is necessary to keep even nations moving. It not unfrequently happens that some external source of excitation

acts like a spur, and their movement is quickened. Accelerations of this character are to be regarded as interferences of Providence in favour of a particular race, to urge them through difficulties which they would not otherwise overcome.

Precisely of this kind was the great Industrial Exhibition of 1851. The people of England were then taught a lesson which they will not soon forget; and if they profit by it, they will still maintain their vantage ground in that healthful struggle of industry which is now rife in the old and the new world.

As a people we were far too proud of our manufacturing powers, and since by our commercial enterprise we had opened markets for our productions in all parts of the habitable globe, we imagined ourselves, in nearly all the economic arts, far superior to any other race, amongst the most civilized of our friendly rivals, who accepted our challenge, and brought to our shores the works in which they each thought they particularly excelled.

It is thus the conviction has been forced upon us, that other nations are our superiors in special branches of manufacture, and that they are advancing by rapid strides to equal excellence in others in which we believed ourselves to stand unrivalled.

The jurors' reports of the great Exhibition, unequal as they are, many of them being most unsatisfactory, form a valuable volume. Everywhere it is suggestive. By careful examination of its pages, recording in detail the multitudinous productions of human labour, we discover the points of our own weakness, and learn the direction in which we should move to secure our position as manufacturers. We need not, on the present occasion, examine this point with any degree of minuteness, it is sufficient for our purpose to state as a generally admitted fact, that in art-manufacture we are considerably in the rear of several continental kingdoms, and that, for the applications of science to purposes of usefulness, we are certainly not in advance of them. Examination of the relative conditions of manufacturing industry will prove this. If we take the examples of our dyes—of the purification of oils—of the manufacture of candles—and the fabrication of lamps, to select two or three examples of the most every-day character, it will be found that they have originated on the Continent, though the processes or manufacture may have been subsequently improved by us. Now, each of these are examples directly of the application of science to industrial uses. These might be multiplied largely, and a careful study of the history of scientific applications would prove that, by separating science from practice, we have allowed ourselves to be anticipated in

nearly all the industries to which the attention of our productive classes has been applied.

Dr. Lyon Playfair, in his introductory lecture, well says,—

'In fact, this is the great question at issue between England and foreign States. With us there is a wide-spread jealousy of science, and a supposed antagonism between it and practice. Mere empirical experience is of slow growth, and, after all, is only adapted for the particular conditions in which it was attained: it is a crutch which will support a lame man, but will not suffice to enable him to run a race; it resembles in its growth the slow propagation of an unaided flora throughout a land, which might be quickly disseminated, if science were allowed to gather its seeds and throw them broadcast over the country. It is only experience, aided by science, that is rapid in development and certain in action. In this country we have eminent 'practical' men and eminent 'scientific' men; but they are not united, and generally walk in paths wholly distinct. From this absence of connexion there is often a want of mutual esteem, and a misapprehension of their relative importance to each other. The philosopher is apt to undervalue the dignity of productive industry, while the practical man sees, in the absence of utilities, only the visionary speculator. Hence the former too often stands apart in self-reliance on his usefulness to the world, and like Themistocles, when asked to play, is inclined to reply, 'Though I cannot fiddle, I can make a little village a great city.' Abroad, the scientific element of production is carefully nurtured, because the truth is there fully recognised, that nothing is so fertile in utilities as absolute abstractions; but it is known also to be essential to industry, that there should be a race of men to translate these abstractions into worldly utilities, and who can solicit nature, in language understood by her, to lend her powers for the fulfilment of practical ends. The creation of this class of men was, as has been shown, a necessity of foreign competition; for, without this superiority in the intellect-element of labour, it was impossible to overcome our advantages in the cheapness of material and in the abundance of capital.

'But this forced perception of the necessity for industrial instruction has enabled the continent to seize the *growing* element of production, while we are left in possession of the *decreasing* one; and while we continue to rely upon local advantages and acquired experience, we allow a vast power to arise abroad which is already telling against us with wonderful effect. It is most essential that we should furnish this element of strength to our producers.'

Such may be regarded to be the feeling in the Royal Commission, and we find, that, having applied to all the great industrial centres for information, they arrive at the following conclusions, which we quote from the Second Report; the commission having been, by a supplemental charter, impowered to dispose of the surplus funds remaining in their hands.

‘These applications and the general tone of public feeling have confirmed the views of the Commissioners, as before expressed to her Majesty, that the requirement most felt by the country is an institution which, in the words already employed by them, should ‘serve to increase the means of industrial education, and extend the influence of science and art upon productive industry.’

‘We are of opinion that if the surplus were applied in furtherance of one large institution devoted to the purposes of instruction, adequate for the extended ranks of industry, and in connexion with similar institutions in the provinces, it would be productive of important results; whilst, if subdivided amongst many local institutions, as suggested by some of the memorials to which reference has been made (such as those from Warrington, Blackburn, &c.), the effects produced would be comparatively insignificant.

‘It is further our opinion, that the greatest amount of benefit would be conferred on the community, if such an institution as that indicated by us were established in the metropolis, and rendered capable, by scholarships and by other means, of affiliating local establishments, over this country, in India, and her Majesty’s colonial possessions, whereby the results of its labours might be disseminated as widely as possible, and great advantage derived from a constant interchange of information between the parent institution and the bodies associated with it.

‘It also appears to us desirable that the proposed institution should act in concert with foreign institutions of a similar character; and we also consider that every advantage which the new institution might offer should be shared equally by the citizens of all countries, and that, by giving facilities to those who might desire to visit this country with a view to inform themselves on subjects relating to science, arts, manufactures, and commerce, some return might be made for the generous co-operation of all nations in the Exhibition of last year; a continuance of the friendly relations which we trust that Exhibition has inaugurated might be insured; and this nation might continue to benefit by an interchange of knowledge with them.

‘The basis for the formation of the desired local connexion at home would appear already to exist in the Provincial Schools of Design, of which more than twenty are at present established in this country, in various industrial institutions,—such as the School of Arts in Edinburgh, the School of Mines in Newcastle, &c., and in the several Mechanics’ Institutes belonging to different towns.

‘The Schools of Design are supported, at present, partly by parliamentary grants, and partly by local subscriptions, and the fees received from students; while the Mechanics’ Institutes referred to have not only endeavoured, of late years, to extend their importance as institutions for systematic instruction, but have manifested a strong desire to enter into connexion with a central institution in London, as evinced at an important and influential meeting held at the Society of Arts on the 18th of May last, which has resulted in the

union of more than 220 institutions, numbering upwards of 90,000 members, all in correspondence with that Society.

'The Royal Dublin Society, which receives an annual parliamentary grant of more than 6000*l.* for the payment of its professors, and for the other purposes of the Society, and which is in the habit of sending lecturers to the provincial towns, on their application, may also be instanced.

'Institutions for industrial instruction exist in most of the Continental States, and have been growing into increased development during the last fifteen years. The marked increase in Continental production has been partly ascribed to the knowledge of natural forces, communicated to those engaged in industry by these institutions.

'In countries in which fuel and the materials of machinery either did not exist, or were not abundant, it was natural to depend more upon the intellectual element of production than in this country, where their abundance gave an impulse to labour, and created much practical experience. It has long been a principle of Foreign States, that the application of science and art to production would more than balance a greater cheapness in raw material; and that the increased facilities of locomotion rendered the latter of less value as an element of manufacture, while it enabled the experience of other nations to be more readily acquired, and consequently would, in process of time, convert industrial competition into one involving the most economical application of natural forces.'

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The Industrial Schools on the Continent are referred to as illustrations of the value of the kind of education advocated. We are assured that there is a constantly increasing demand by those engaged in industry, for the pupils reared at the Industrial Schools; and as a consequence of this, it is found that the number of pupils is everywhere augmenting. The reporter in continuation informs us,—

'It is calculated that in Germany alone 13,000 men annually receive the high technical and scientific training of the Trade schools and Polytechnic institutions; while more than 30,000 workmen are being systematically taught the elements of science and of art, in schools which communicate instruction to them in their leisure hours.

'Besides the Trade schools which are now scattered throughout Germany, there are important institutions, equivalent to Industrial universities, in the capitals of nearly all the German States. Their systems of instruction have certain variations, but they are all agreed upon the general principle, that their object is to teach the principles of science and art upon which production depends, explaining fully the variations and nature of technical processes, but leaving them afterwards to be practically learned in the workshop or the factory. They rather teach a pupil how to be an intelligent manufacturer, than profess to make him one at the Institution.

‘Elementary knowledge in science is rarely given at these higher schools, as the pupil who enters them must previously possess it, the courses of instruction there being devoted to the application of that knowledge. So essential to the progress of industry are these Technical Colleges considered, that even small States, such as the Grand Duchy of Baden, support them at great expense. Thus the Institution at Carlsruhe, situated in a large and commodious building, with every appliance of museums, laboratories, and workshops, teaches 330 pupils, with the aid of no less than forty-one professors and teachers. In France, the *Ecole Centrale des Arts et Manufactures*, a private institution raised by private capital, which has found and continues to receive, the most ample remuneration in its success, annually educates 300 pupils in the highest branches of applied science and art; while its influence on industry has been found so important, that the Government and the Councils-General of twenty-nine departments of France have established exhibitions in connexion with it, in order to educate poor persons of extraordinary talent. The pupils of this establishment find immediate employment on leaving the school; and already above 500 of them are known to be holding stations of much importance in almost all parts of the world. The school is now found to be too small for the demands of French industry, and its enlargement is under contemplation. We must, however, simply refer to the extracts from Dr. Playfair’s lecture, for further information on the industrial institutions of other countries, both as regards the instruction of the middle classes and of artisans, remarking that the evidences of the increase in the number of the pupils, as well as the readiness with which they obtain employment, would afford sufficient proof of their influence upon industry, were there no other direct testimony to the important influence which they are exercising on the rapid development of production in foreign States.’

From these quotations our readers may gather some general notion of the objects which the Royal Commissioners think desirable to carry out in this country. That they are earnest in their desires to effect an intimate union between science, art, and manufacture, is proved by their having purchased a large quantity of land, upon which they hope eventually to rear a university of science, art, and industry.

The ‘Gore-House Estate,’ which is very nearly opposite the site of the Exhibition Building, has been purchased. This property contains twenty-one and a half acres, possessing a frontage of between 500 and 600 feet in the Kensington Road. The cost of the estate has been 60,000*l*. The trustees of the Baron de Villars have also disposed of this estate to the Royal Commissioners for the sum of 153,500*l*; this being forty-eight acres in extent, and immediately adjoining the Gore-House estate.

The surplus remaining in the hands of the commissioners from

the 'shillings of the million' will be nearly 170,000*l*. The property purchased already, has cost 213,500*l*.; and it is deemed desirable to secure some additional pieces of ground connected with those estates already named. The House of Commons, on the recommendation of Mr. D'Israeli, then Chancellor of the Exchequer, voted 150,000*l*. more towards effecting this object. 300,000*l*. will, therefore, be invested in land, of which the public are invited to avail themselves.

'The question of the apportionment of the ground among the different institutions to be erected upon it, or of its division between the Government and the Royal Commission, as already spoken of, must obviously be left for future consideration and arrangement. It appears to us, however, that it would be desirable that the new National Gallery, if placed in this locality, should occupy the advantageous and more elevated site fronting Hyde Park, on the Gore-House estate; while an institution like the Commercial Museum or Museum of Manufactures, already suggested by us, might be established on the corresponding site fronting the Brompton Road, at the further end of the property; the central portion containing a building in which the different societies might procure that juxtaposition, the means of effecting which, as we have before mentioned, they have been for several years considering; while the two sides might be devoted to the departments of Practical Art and Practical Science. Although a considerable period will naturally be required for the development of a plan of the comprehensive nature of that which we have now submitted, intended as it is to furnish the means of providing for public wants even at distant times, yet an immediate enjoyment of the grounds may be secured to the public, affording a useful and agreeable addition to that offered by Hyde Park and Kensington Gardens.'

Considerable differences of opinion prevail on the question of the proposed scheme of Industrial Instruction, and on the expenditure of so large a sum of money as 300,000*l*. for a certain quantity of space, and *unoccupied* space. The first building which will rise upon this now national property, will be undoubtedly a New National Gallery, the want of which is admitted by every one. All the reports which have been made on the national pictures, and their safe keeping, suggest the advantages of removing them beyond the influences of those chemical agencies which deteriorate the atmosphere of a crowded city. The commissioners in particular appointed 'to consider the question of a site for a New National Gallery,' in their report laid before Parliament in August, 1851, state very strongly their opinion of the advantages of the neighbourhood of Hyde Park and Kensington, not only on account of the dry character of the soil, but also because 'those large open spaces afford a present

'security against the inconvenience to which the National Gallery is exposed, and are the only grounds which remain safe for future years amidst the growth of the metropolis.' In constructing a New National Gallery, it will become a matter for careful consideration, whether the remains of Ancient Art, which are in the British Museum, should not be associated under the same roof as the National Pictures. As the Monolithic relics of Egyptian and Assyrian art, the marbles of Greece, showing the delicate appreciation of the beautiful by the inhabitants of that land to which we owe so much, and those of the Romans, together with their art manufacture, are preserved as studies for the living artists,—the past ministering, as it does ever, to the present—it would appear fitting that these objects teaching the laws of symmetry, should be near those in which are developed the laws of chromatic harmony.

A Museum of Manufactures is also indicated in the quotation last given. In the Museum of Practical Geology, the Museum of Practical Botany, and the Museum of Practical Art, we have three national establishments, which would, when brought together, form a most important nucleus, around which might easily be developed examples of all our industries.

The space required by such a 'Commercial Museum' would necessarily be a very large one; and if it included, as we suppose it would do, models of machinery, this alone, in a few short years, would occupy all the ground at present purchased. We perceive that many difficulties, and some serious objections, will surround this subject. These will not yet be brought directly under consideration, therefore we need not any further allude to them at present, the question of education being one more pressingly important.

Education in art has been already recognised as a necessity, and hence Schools of Design, and a Department of Practical Art; have been established, by the joint influence of the people themselves and the government.

With a few exceptions, the Schools of Design have proved failures. The inhabitants of the localities in which they have been established have failed to recognise their utility; or, the Schools of Design having disappointed the hopes of their first sanguine projectors, they have been allowed to fall into cheap drawing schools, and all attempts at cultivating the power of *designing* have been abandoned. Sheffield and one or two other large manufacturing towns are to be excepted; but, by fortunate circumstances, these towns have been enabled to throw exciting elements, in the way of direct applications, into the schools, which have acted by giving them a considerable degree of vitality.

The great cause of the want of success in the Schools of Design in general, is, that the bulk of the people are not prepared to distinguish between that which is good or bad in art manufacture; they do not understand symmetrical form or harmonious colouring. It is necessary to educate the senses to the appreciation of the beautiful; and until this is effected throughout the larger number of the people, they will be as well satisfied with the inelegant and the gaudy, as with the regular and the chaste. It has been said by the superintendent of the Museum of Practical Art, that in art and art manufacture the demand must always regulate the supply; and this has also been applied by him to science and its applications. In both instances, a mistake fatal to all progress is committed. It is perfectly true, that demand regulates supply in manufactures; and that if a gaudy cotton print is required by the public, the calico-printer employs all his elements of production to meet this demand of a perverted taste. If a textile fabric of greater merit is in request, the manufacturer then endeavours to meet the improved taste of the time. But this is not the question to be considered by those who would improve the intellectual condition of the people. By education in arts—which can only be properly employed by the cultivated minds of those who have already laboured diligently along some especial path of improvement—the public are to be taught to feel offended with tasteless things; and when this is effected, they will begin to teach the manufacturer that the production of the elegant in form, and the harmonious in colour, should be the object of his study. While the mass of the people are so educated, that they are indifferent as to the artistic character of the things they employ—whether for daily use or occasional ornament—and retain their fondness for meretricious decoration and violent contrasts in colour, they will not pay for the education of a better class of artists than those now existing. By the large majority of the inhabitants of towns in which the Schools of Design are established, we know them to be regarded as nearly useless institutions; or, at the best, but cheap drawing-schools, at which the *accomplishment* of drawing can be learned by their children, with the greatest economy to themselves. To render, therefore, the Schools of Industrial Art what they should be, it becomes necessary to diffuse across the length and breadth of the land a better order of education than that which now prevails.

The manufacturer is now the instructor of the masses he supplies; or, if he is directed at all, it is by the shopkeeper, through whom his goods find their way to the public. The best taste is very readily perverted; and by constantly placing any unsymmetrical production before the eye, it becomes accustomed

to its want of unison, and even learns to regard it with much favour. Therefore, in every way it is evident that the rule of demand regulating supply cannot be applied to improvement in art manufacture. The production must precede the demand to some extent, and our children must be educated to regard the tasteless as offensive. In science, this objection applies with still greater force. There is not a single application of science to useful ends, which could have been produced by any amount of demand, if there had not previously existed a knowledge of those laws called *abstract*, which are too frequently regarded as valueless by those who can only regard inductive research as so much valuable industry wasted.

Mill, in his *Political Economy*, places the value of abstract science so forcibly before us, that we quote his words:

‘In a national or universal point of view the labour of the savant or speculative thinker is as much a part of production, in the very narrowest sense, as that of the inventor of a practical art; many such inventions having been the direct consequences of theoretic discoveries, and every extension of knowledge of the powers of nature being fruitful of applications to the purposes of outward life. The electro-magnetic telegraph was the wonderful and most unexpected consequence of the experiment of Oersted, and of the mathematical investigations of Ampère: and the modern art of navigation is an unforeseen emanation from the purely speculative, and apparently merely curious, inquiry by the mathematicians of Alexandria, into the properties of three curves formed by the intersection of a plane surface and a cone. No limit can be set to the importance, even in a purely productive and material point of view, of mere thought. . . . Intellectual speculations must be looked upon as a most influential part of the productive labour of society, and the portion of its resources employed in carrying on and remunerating such labour, as a highly productive part of its expenditure.’

Since in this country, hitherto, science has been regarded as nearly valueless until it comes to be *applied*, it has been neglected in education. Science has not even yet received its full recognition from politicians, and the manufacturer is still contented with the empiricism by which he has slowly improved his works, and speaks of *experience* as something infinitely superior to *research*.

The Continent furnishes us with a different set of examples, and these have been very fully developed by Dr. Lyon Playfair, in his Lecture; by the aid of which we attempt a rapid analysis of the industrial instruction abroad, as contrasted with what we are doing at home.

In the Industrial Schools of Germany, it appears that not less than 13,000 students are now receiving a scientific educa-

tion ; but this does not exclude from attention other subjects which materially influence the well-being of society.

Taking one example, out of many of the same general character, we shall see what is done in this direction in Bavaria.

'In Bavaria there are no Real schools, and only a few of the Gymnasias introduce realities into their courses ; but there are twenty-six Trade schools, or, in fact, one such school for every large town. I find by the statistics of twenty-one schools, which I have obtained, and proportioning for the five, of which I have no account, that there are above 3000 pupils annually obtaining the high education given in these Trade schools. The schools are supported by the Commune, aided, when necessary, by the Province. The management of the schools and appointment of the professors rest with the locality ; but the Government exercises a supervision, and sends commissioners annually to examine and report upon them to the Minister of Trade. The courses extend over three years ; and as the entrance age is twelve, the pupil at fifteen may pass into the higher Polytechnic colleges. Of these there are three, one being in Munich, another in Nuremberg, and the third in Augsburg. They are chiefly supported by Government, which allows, however, only 39,000* Bavarian florins, or 3250*l.*, for their support ; and the number of pupils amount to 481, the professors being thirty-four in number. In addition to these higher Polytechnic schools, there are two Commercial schools, also supported by Government (at Nuremberg and Furt), and there is a Building school at Munich, which is chiefly intended for the instruction of master masons and carpenters. Besides these, there are Industrial schools for workmen on Sundays and holidays ; and the pupils attending them cannot be less than from 8000 to 10,000.

'The system of industrial instruction in Bavaria dates from 1833, and so satisfied is the Government with its effect, that they continue to support and extend it with great liberality. It would be impossible in this lecture to describe to you the details of the systems of instruction pursued, even in each of the three head colleges ; and I confine myself to simply giving you the scheme of the Munich institution, referring you to the Appendix for fuller descriptions. I ought, however, to state, that it would require a union of all three colleges to make really one Polytechnic Institute ; as each of them practically, though not professedly, gives a leaning to special branches of the Arts ; thus, Munich chiefly devotes itself to civil engineers and architects ; Augsburg, to mechanists ; and Nuremberg, to chemists ; I confine myself, however, to the Institution at Munich, as an illustration. It is situated in a large and commodious building, possesses admirable collections, especially one of physical apparatus, and has a modelling and

* Munich receives 18,000 florins, Augsburg 9000, Nuremberg 12,000 ; and in addition, they may receive from 800 to 1200 florins (1 florin = 1*s.* 8*d.*) each from pupils.

sculpture workshop in great activity. The number of its professors and teachers is sixteen, and of pupils 307, of whom eighty-three are foreigners. Its course of general instruction extends over three years, but engineers take a special fourth year's course. The scheme of instruction is as follows :

COURSE I.		COURSE II.	
Hours.		Hours.	
7	Mathematics.	7	Analytical mechanics.
7	Physics.	6	Machinery and machine drawing.
7	Machinery and machine drawing.	2	Plan drawing.
2	Plan drawing.	7	Chemistry.
3	Descriptive geometry.	7	Differential and integral calculus.
2	Ornamental drawing.	4	Architecture.
2	Catholic religion.	3	Building materials.
2	Protestant religion.	3	Electro-magnetism and telegraphs.

COURSE III.		ENGINEERING COURSE.	
Hours.			
7	Applied mechanics.	12	Roads and bridges (in winter).
4	Geodesy.	12	Hydraulic engineering (in summer).
5	Machinery and machine drawing.	12	Constructions and projections ; building, surveying.
6	Analytical chemistry.	8	Architectural drawing and model- ling.
6	Applied architecture.		

In addition to this high class of instruction, we find, in Germany, that from 30,000 to 40,000 workmen are instructed in the Industrial Sunday Schools, in all those branches of education which are known to have a commercial value. The *Ecole Centrale des Arts et Manufactures*, in France, is, beyond any other continental institution, one to which Englishmen should have their attention directed, since it has arisen entirely by the efforts of the people to provide for themselves an establishment to meet the demands of native industry.

‘It is well known that France encourages to a great extent the industrial instruction of its producers. The *Ecole Polytechnique* of Paris, the *Ecole des Ponts et Chaussées*, and the *Ecole des Mines*, have been too often described to require more than a passing reference to them. But as they are chiefly for the instruction of Government *employés*, they do not necessarily act immediately on private production. At the same time it is not to be forgotten that it is the principle of the French Government to act upon its own perception of right by instructing the population, even before formal demands have been made, on the part of the public, for the benefit which is thus conferred. It is therefore the more surprising, that the middle classes for some time urged their want of an institution for the industrial instruction of their producers, without carrying conviction of its necessity to the Government. Impelled by the urgency of the want, a private institution was raised; and the feeling in its favour was sufficiently strong to induce a capitalist to embark a large sum of money in founding it. This private institution, raised in a capital where the public schools are altogether under the Government, proved that it was a

necessity of the times by its immediate and eminent success. Thus rose the *Ecole Centrale des Arts et Manufactures*, now the most important industrial institution in France. It possesses the most eminent men of France as its professors, and it has reared those who promise to be her future brightest ornaments. As a commercial speculation it has been singularly successful, and it still remains under the business direction of the original enterprising capitalist, M. Lavallée. The Government now gives to it a certain number of exhibitions to educate poor students of extraordinary talents, and the Councils General of twenty-nine departments of France also do the same. The appreciation of its importance to France may best be seen in the Report of the Commission of the Chamber of Deputies appointed to inquire into the budget :

'You know, gentlemen, this useful establishment was founded in 1829, by the association of eminent professors, with the intention of forming civil engineers, the directors of works, the chiefs of workshops and factories. This private institution, which by its importance rivals in excellence our first public establishment, has created and put in practice a complete system of industrial education. It is at the same time a supplement to our Polytechnic School, and an addition to our various applied schools. Such an institution ministers to one of the first necessities of the age, therefore its success is complete. This is confirmed both by the unanimous opinion of the first manufacturers of the country, and by the ease with which all the pupils educated at it have received employment.'

'The school possesses 40 professors and teachers, and 300 students, each of whom pay 36*l.* annually. The number of the latter is only limited by the size of the building, and it is in contemplation to remove to one considerably larger. The courses extend over three years, and are compulsory on all; but in the second year the practical operations divide into two parts, the one general, and the other applicable to one of the four following specialities :

- A. Mechanists.
- B. Engineers.
- C. Metallurgists.
- D. Chemists.'

In Belgium, in Denmark, and in Sweden, similar industrial institutions have been long established, and the results have been in all cases most satisfactory.

Disguise it as we may, flatter ourselves as we best can, here is a manifest fact. The continental states are availing themselves of the powers of the highest authorities in art and science to improve their respective industries, while we are yet trusting ourselves to the comparatively blind guidance of an empirical system.

It will be said that the peculiar constitution of the mind of the Saxon races is such, that, by its unaided energy, and by its untiring industry, it does effect for itself that which others are doing by extraneous aids. This is true in part, but false in its

general bearing; and a careful examination of the history of our respective industries will show how deeply we are indebted to those extraneous aids which, while we have refused them recognition, we have employed, by a sort of left-handed course, and claimed for our own *experience* things which were really due to the *experiments of others*.

The Exhibition appears to have opened our eyes, however, to the fact, that there are people who can excel us in many of our specialities of industry. Russia and Sweden manufacture iron superior to our own, and the metallurgical processes on the Continent are admitted to be in advance of ours. The English light-houses are constructed with French glass. The English chemist is compelled to go to Germany for the porcelain vessels which he uses in his investigations. The British artist looks to the Continent for his supply of carmines, lakes, and ultramarines; and the dyer declares that it is something in our atmosphere which prevents his producing colours of equal beauty to those obtained by the dyers in France; the actual difference, however, arising from the exact system of the latter, and the 'rule of thumb' system of the former.

One of the juries of the Great Exhibition of 1851, thus conclude their report:

'The Jury of Class 30, having brought their labours to a conclusion, cannot refrain from expressing their hope that steps may be taken for rendering the Great Exhibition as useful after it has ceased to be, as it has proved gratifying and instructive in the course of its short existence. It is the wish to see these hopes realized that impels the jury, even at the risk of overstepping the strict limits of their functions, to submit, with great deference, their views on this point to the Royal Commissioners. The foundation of a permanent industrial museum in the heart of the metropolis of trade and industry, seems to the jury the logical and practical consequence of this Exhibition. It is in the Crystal Palace that the great truth has been impressed upon us, that art and taste are henceforth to be considered as elements of industry and trade, of scarcely less importance than the most powerful machinery. It seems also natural that this museum should, in the first instance, consist of the objects to which the several juries have called public attention as happy types and models for imitation. While such a museum on the one hand would be a lasting depository of industry and of the arts, it would, on the other, serve as the best and easiest standard of comparison, by which human ingenuity might mark its progress on the opening ten years hence of a new Great Exhibition: it would serve alike as a guide and as a beacon.'

Our government has been long convinced that some assistance was required to improve the taste of the people, and hence they have given aid to the Schools of Design, desiring, however,

to render them entirely independent of any such support. This is shown by the fact that the salaries of the Professors at the Museums of Practical Art have been reduced, and they are to depend for their remuneration on the fees produced by the students in the schools.

It is admitted that one cause of the failure of Schools of Design has been, that although the pupils have been taught to draw, and even to design, they have not been instructed in the peculiarities of the material to which their designs are to be applied. Of all the technical difficulties of each special manufacture, they have remained quite ignorant; and hence many of their best productions have been useless to the manufacturer for whom they were intended.

Our Government now purposes to try the experiment of extending some aid to the advancement of that knowledge which is found to be necessary in every kind of handicraft. It is contemplated to raise up a National Museum, in which to examine and compare the works of our own country with the productions of other lands; and a University, in which a technical system of education of the best class may be obtained. Space is secured for this, but nothing more. The Royal Commissioners have no more funds, and the House of Commons, at present, is not likely to vote any additional sum for educational purposes, beyond that at present granted, amounting to 470,762*l.*, which is employed as follows:

1. Public Education (Britain)	£160,000
2. Ditto (Ireland)	164,577
3. Board of Trade. <i>Department of Practical Art,</i> <i>including Schools of Design</i>	17,920
4. Professors, Oxford and Cambridge	2,006
5. University of London	3,957
6. Universities &c. in Scotland	7,560
7. Royal Irish Academy	300
8. Royal Hibernian Academy	300
9. Royal Dublin Society	6,340
10. Theological Professors at Belfast, and Belfast Academical Instructors	3,000
11. Queen's University, Ireland	1,710
12. { British Museum Establishment	52,343
{ Ditto " Buildings	21,350
{ Ditto " Purchases	2,966
13. National Gallery	2,495
14. Museum of Practical Geology, and Geological Survey	14,920
15. Scientific Works and Experiments	4,018
16. Galleries of Art, Edinburgh	5,000

Everything, therefore, is left in the hands of the people themselves. If the public voice is in favour of an improved system of education—that is, a system superadding science and art to our present conventional mode, and will show their earnestness in this by taxing themselves temporarily—the Government, we have reason to believe, is prepared to render to science the kind of aid it renders to the local Schools of Design at present.

There has been a considerable movement of late amongst the mechanics' institutions of the country, and certain attempts have been made to improve their usefulness. The time has been short, consequently the results could not be apparent. In the Society of Arts has originated an idea of converting them into *trade schools*; or, rather, perhaps of appending such schools to them. On the interpretation given to the term *trade*, depends entirely the effectiveness of the scheme. If youths are to be taught to handle tools, and to acquire manipulatory facilities, we foretel its failure; since it has been found that boys who have been so educated have so much to unlearn when they enter a workshop, that others who start without this preliminary tuition, go fast a-head of them. Experience, too, has proved the defects of the system. The following quotation, from Dr. Hudson's *History of Adult Education*, places in its truest light the position of the mechanics' institutions considered as industrial schools.

'The workshops of the London, the Manchester, and the Newcastle Mechanics' Institutions, had a short career; and, indeed, wherever industrial education has been attempted in these institutions, it has proved a signal failure. Several societies are rich in philosophical apparatus, in working models of machinery, and in cabinets of minerals; but these stores, if not absolutely valueless, have been comparatively useless. Manchester, Leeds, Glasgow, and London, have each collections of this nature, on which the dust has been long accumulating. On the other hand, the formation of chemical laboratories (where the entrance to them has not been barred by heavy fees) have realized all that could be anticipated, or that their capabilities would allow. The chemical classes of Leeds, Bradford, Wakefield, Manchester, Westminster, York, Glasgow, and Newcastle, are just examples of the general taste for chemical science.

'Lectures have met with a premature decay. The older institutions made their engagements for long and complete courses in each branch of science, somewhat of the character of university lectures, with examinations testing their usefulness, and taxing the attention of their auditory. From complete courses of ninety and sixty lectures, upon one branch of physical science, lectures have dwindled to an average of three in each course, and a general practice of having one lecture for each branch of science. In the choice of subjects, the change has been equally unfavourable; the plain and easily understood

discourses on the elements of the sciences, and their application to the useful arts, illustrated by numerous experiments, have been abandoned; and the preference shown for light literature, criticism, music, and the drama, has given just occasion for the statement, that even the elder Metropolitan Mechanics' Institution, since its establishment, has given more attention to the drama than to the entire range of physical science.

It appears, however, of the first importance, that every workman should know something of the physical character of the substances upon which his industry is employed. This he can only acquire by giving some attention to practical science. Every man, yea, every boy, should be acquainted with the laws of motion—the mechanical powers—and have some particular knowledge of hydro-dynamics, as involving the applications of the impulsive powers of water and air. Beyond this, a general acquaintance with the laws by which the physical forces are regulated should be acquired.

Our Mechanics' Institutions might, by directing their attention to this end, become more valuable establishments, and take the position of local industrial schools. These must be founded on the principle of being self-supporting. If in the difficulties of starting, the Government should be induced to render some assistance, they should be taught that this is only temporary, and that as soon as fairly launched, they must rely upon themselves.

As incentives to industry, the establishment of scholarships might prove of much advantage, as enabling the intelligent and industrious, though poor student, to receive that superior education which the metropolitan institutions could alone afford him, and which would fit him for a superior position in the workshop or manufactory. By establishing local schools on such a system, and making the success of the central university depend entirely on the healthfulness and vitality of the most distant ramifications of the roots, an institution in strict accordance with the self-reliant habits of our country might be reared, which would spread out its branches and embrace the whole of our industrial community within their protecting shadows.

Any hothouse system, in which well-salaried professors and government officials labour merely to maintain the appearance of usefulness, by forcing up a few fine plants, would soon degenerate; and having produced a few abnormal and useless growths, would moulder and decay. But a system, in which every member should be made to depend directly upon the public for support, would be certain of existing in all activity, and of producing the best possible results for industrial Britain.

Hoping that such will prove to be the view taken by the Royal Commissioners, with Prince Albert at their head, and by the government of the country, we are disposed to commend the scheme shadowed forth in the second Report, and to aid, as far as consistent with our views, in its development.

- ART. VII. (1.) *Russia*. By the MARQUIS DE CUSTINE. 3 vols.
 (2.) *Life in Russia*. By EDWARD P. THOMSON, Esq. 8vo.
 (3.) *Austria*. By EDWARD P. THOMSON, Esq. 8vo.

France is again an empire. The tyranny fastened on that country by the first Napoleon, is succeeded by another more iron-handed, and in every way more humiliating than the former. France was the one power on the Continent of Europe that might have been expected to show itself strong on the side of freedom. But even France now stands pledged to the great league of the prepared heads against humanity. The hour is dark, will probably grow darker. The great device just now is, to exhibit a government by oppression, as the only government that can be allied with peace; to describe arbitrary power as the form of power specially fitted to ensure material prosperity to a people; and to assure us that the spot pre-eminently favourable to the highest development of humanity, will be found beneath the shadow of the tree of despotism. The effrontery of all this, as addressed to the men of Europe in the middle of the nineteenth century, is not a little extraordinary.

We are bound to confess, however, that absurd—contrary to all history and experience, as this language may be, it is not reiterated and emphasised, after the present shameless fashion, altogether in vain. Many have come to believe in it—and many affect to believe it. The former consist of the ignorant, and may be pitied; the latter consist, for the most part, of the selfish and the servile, towards whom our feeling is something different from pity. The men among us who seem disposed at this moment to ignore the ever-wasting, ever-destroying tendencies inseparable from the working of arbitrary power, may be divided into three classes, consisting of the remnants of our old Tory faction, of a considerable portion of our mercantile men, and of the more zealous patrons of our peace societies. Toryism judges of the greatness of a people by the strength of its monarchy; with not a few of our mercantile men, the test of prosperity everywhere is a good market; and with our peace society friends, the atro-